F1-031

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JUL 25 1997

CALFED Bay-Delta Program Office
1416 Ninth Street, Suite 1155
Sacramento CA 95814

Research Proposal Entitled
"The Ecology of the Red Fox (Vulpes vulpes) in the North Bay and the Development of a Management Strategy"
RFP: 1997 Category III Ecosystem Restoration Projects and Programs
Principal Investigator - **Michael L. Johnson**

Dear Colleague:

It is our pleasure to present for your consideration the referenced proposal in response to **the CALFED Bay-Delta Program RFP.**

Please call on the principal investigator for scientific information. Administrative questions may be directed to me or my assistant, René Domino, at the above address and phone number. We request that correspondence pertaining to this proposal and a subsequent award be sent to the Office of Research and to the principal investigator.

Sincerely,

Sandra M. Dowdy
Contracts and Grants Analyst

Enclosure

cc: M. Johnson

Executive Summary

Title: The Ecology of the Red Fox (*Vulpes vulpes*) in the North Bay and the Development of a Management Strategy

Michael L. Johnson, Principal Investigator; University of California, Davis

Project Description

The overall objectives of this proposed project are to: 1) develop an understanding of the ecology of the red fox in the North Bay; and 2) use this understanding to develop a control strategy to minimize the impacts of the red fox on native biota. Within these two objectives, there are several tasks.

1. Develop an understanding of the ecology of the red fox in the North Bay.
    A. Estimate the abundance of red fox in the North Bay.
    B. Estimate basic demographic parameters (reproduction, survival, and potential immigration and emigration).
    C. Document daily and seasonal movements and habitat use.
    D. Determine the diet of the red fox in the North Bay.
2. Develop a control strategy to minimize the impacts of the red fox on native biota.
    A. Quantify the impact on each target species from red fox.
    B. Determine the timing, location, and level of effort required to reduce the red fox population to levels where they no longer pose a significant threat to the native biota.

Approach

This project will require capturing and radio collaring individual red foxes and following them over time. Monitoring will involve both intensive focal animal tracking, and periodic location monitoring. We will obtain the demographic data necessary to estimate survival and reproduction of different age classes, estimate population density and population growth rate of red fox in the North Bay, document habitat use, diet, and immigration corridors (if they exist). Using a GIS, we will plot home ranges of foxes on available coverages to determine if there is an association of specific habitat features with fox home ranges. Using the combination of current distribution of red fox, the distribution of species of concern in the region, and diet analysis, we will develop a risk index for each prey species of interest in the North Bay. We will use the demographic data acquired from the field monitoring to develop a spatially explicit demographic model to project the red fox population size in the North Bay. We will provide information about the required effort of trapping, timing, and location of trapping to maximize the red fox control efforts. We will use the demographic models developed during the risk analysis, and the distributions of prey species developed during the GIS analysis, to estimate the trapping effort that will be needed to keep the population of red fox at acceptable levels in the future. The population projection model will be given to CALFED agencies to use in evaluating their future control efforts.

Justification for Project

The red fox is a stressor that falls under the category Undesirable Species Interactions, subcategory Elevated Predation/Competition Losses (#6, Attachment C). Red fox predation is considered a threat to the continued persistence of native biota throughout the San Francisco Bay area. The North Bay contains one of the largest remaining populations of the salt marsh harvest

mouse and large populations of black rails. Additionally, with the initiation of wetland restoration activities in the North Bay, there exists the potential for increasing populations of numerous threatened and endangered species. These populations will be at risk if the red fox is not controlled. This project will provide the information necessary to control the red fox population. Efficient control of the red fox prior to its achieving high abundance will guarantee that populations of native biota do not experience bottlenecks that may expose them to demographic and environmental stochastic effects and potential inbreeding due to reduced genetic diversity.

Budget Costs and Third Party Impacts
Total cost of project: $704,308
There will be no third party impacts as a result of this project. At the end of the project, we will provide the resources agencies with a population projection model that can be used to judge the efficiency of the red fox control program.

Applicant Qualifications
Dr. Michael Johnson is the principal investigator and will be responsible for the completion of the project. He is an Associate Research Engineer in the Department of Civil and Environmental Engineering at the University of California Davis, and is a Graduate Advisor for the Conservation Biology Area of Emphasis in the Graduate Group in Ecology. Trained as a mammalian population biologist, he has been conducting mark-recapture studies on mammals for over 20 years and has numerous publications on the demography and dispersal. Dr. Johnson is also an expert in risk analysis, and has developed computer models to evaluate the effects of management options on species' demographic performance. He holds all appropriate federal and state permits to conduct the research. Seth Riley will be the postdoctoral research associate on this project. He is completing his PhD at the University of California, Davis in the Graduate Group in Ecology (October 1997). His dissertation research is on the ecology of bobcat and gray fox in the Marin headlands and the west shore of Marin county. He has considerable experience trapping, handling, anesthesizing, collaring, and radio tracking fox (and other mid-sized carnivores that we might encounter). He holds all necessary permits to conduct this project.

Monitoring and Data Evaluation
The results of this project will be submitted for publication to peer reviewed journals. All data will be available to CALFED agencies.

Compatibility with CALFED Objectives
We believe that this project focuses on high risk species and will provide broad ecosystem benefits. Restoration of habitat will provide only half of what is necessary to guarantee the continued existence of native biota. By effectively controlling the red fox, we will remove the other major barrier to restoring healthy populations of native biota that are now threatened and/or endangered. Additionally, in the past we discussed a similar project in the South Bay with personnel from the Don Edwards San Francisco Bay National Wildlife Refuge. They were enthusiastic about this project, however we were unable to find the funding to support the effort. Performing the project in the North Bay will allow us to develop a red fox demographic model and control strategy which can be used in the South Bay.

The Ecology of the Red Fox (*Vulpes vulpes*) in the North Bay and the Development of a Management Strategy

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Graduate Group in Ecology
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Type of Organization: State Agency
94-6036494-W
Financial Contact Person: Office of Research (916-752-2075/5432 fax)

RFP Project Group Type: Other Services

Principal Investigator: Michael L. Johnson

Typed Name of Authorized Representative:

Signature of Authorized Representative: Sandra M. Dowdy

Title: Sandra M. Dowdy
Telephone number: Contracts and Grants Analyst
Date Signed: JUL 25 1997

I-000911

Project Description and Approach

The overall objectives of this proposed project are: 1) develop an understanding of the ecology of the red fox (*Vulpes vulpes*) in the North Bay, and 2) use this understanding to develop a control strategy to minimize the impacts of the red fox on native biota. The objectives of this proposal will be achieved through four different phases of work: field monitoring of individual foxes, GIS analysis of habitat utilization, impact analysis of fox predation, and development of a control strategy.

Field Monitoring. Field monitoring will involve capturing and radio collaring individual red foxes and following them over time. Monitoring will involve both intensive focal animal tracking, and periodic location monitoring. We will obtain the demographic data necessary to estimate survival and reproduction of different age classes, estimate population density and population growth rate of red fox in the North Bay, document habitat use, diet, and immigration corridors (if they exist).

GIS Analysis. We will plot home ranges of foxes on available coverages to determine if there is an association of specific habitat features with fox home ranges. We will obtain or develop coverages of species' ranges for those threatened or endangered species considered at risk from predation by red fox.

Impact Analysis. Using the combination of current distribution of red fox, the distribution of species of concern in the region, and diet analysis, we will develop an index of red fox impact on each prey species of interest in the North Bay. We will use the demographic data acquired from the field monitoring to develop spatially explicit demographic models to project the fox population(s) size in the North Bay. Using the projections, we will estimate the potential impact of red fox on prey species for periods of time into the future. These projections can include the effects of any restoration efforts that may occur in the area (e.g., the Napa Marsh properties recently acquired by the State of California). For example, restoring salt ponds to tidal salt marsh may have the intent of increasing salt marsh harvest mouse habitat, but may increase the amount of available denning habitat for foxes. The net result may be a decrease in the number of mice, despite the expense and effort expended on the restoration.

Control Strategy. We will provide information about the required effort of trapping, timing, and location of trapping to maximize the red fox control efforts. We will use the demographic models developed during the impact analysis, and the distributions of prey species developed during the GIS analysis, to estimate the trapping effort that will be needed to keep the population of red fox at acceptable levels in the future. We anticipate working closely with both the U.S. Fish and Wildlife Service and the California Department of Fish and Game in this phase. Other control options will be evaluated as needed.

Location of Project

This project will be conducted in the North Bay region, primarily the counties of Marin, Napa, and Sonoma, and possibly Solano.

Expected Benefits

The red fox is a stressor that falls under the category Undesirable Species Interactions, subcategory Elevated Predation/Competition Losses (#6, Attachment C). Red fox predation on California clapper rails (*Rallus longirostris*) is considered a threat to the continued persistence of clapper rails in the Bay-Delta system, and red fox are believed to be a significant threat to species such as the salt marsh harvest mouse (*Reithrodontomys raviventris*) and California black rail (*Laterallus jamaicensis coturniculus*) (Harvey et al. 1992). The North Bay contains one of the largest remaining populations of the salt marsh harvest mouse and large populations of black rails. Because of the low number of harvest mice that remain in the South Bay, maintaining the population in the North Bay is a high priority. This project will provide the information necessary to control the red fox population. Efficient control of the red fox prior to its achieving high abundance will guarantee that populations of native biota do not experience bottlenecks that may expose them to demographic and environmental stochastic effects and potential inbreeding due to reduced genetic diversity.

Background and Biological/Technical Justification

The red fox was introduced to the Bay-Delta system by hunters and releases from fur farming operations, probably in the early 1900s (Harvey et al. 1992). Gradually, they increased their range and abundance, and reached the South Bay in the 1980s (Monroe and Kelly 1992). They are now found in the North Bay (M. Johnson, personal observation), and if history is any indication, they will soon increase in number to the point where they will become a significant predation risk to the native avian and mammalian fauna.

The North Bay contains large expanses of tidal salt marsh, and consequently, is home to populations of several endangered or threatened species, or species of special concern. One of the most critically endangered bird species is the California clapper rail. While most of the clapper rail population is thought to reside in the South Bay (Monroe and Kelly 1992), recent evidence indicates that there are substantial populations present in the North Bay (Garcia 1995). In addition, as federal and state wetlands restoration projects are initiated in the North Bay (e.g., Napa Marsh Unit conversion in the San Pablo Bay National Wildlife Refuge), the population of rails can be expected to grow. In order to insure that the growth does occur, it will be necessary to eliminate nonnatural threats to the species. Also, the North Bay is home to numerous other species of concern including the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), the California black rail, and the San Pablo song sparrow (*Melospiza melodia samuelis*).

Given that the red fox is known to prey on a large number of avian and mammalian species (Golightly et al. 1994), has a relatively rapid population growth rate, and can quickly reduce the size of bird and mammal populations, it is critical that we learn enough about their ecology in the North Bay to develop an effective and efficient control strategy. We propose to obtain that understanding and use the information to develop a management strategy to keep the risk of fox predation at a minimum. Under the two primary objectives, there are several tasks that will be addressed.

Objectives

1. Develop an understanding of the ecology of the red fox in the North Bay.
    A. Estimate the abundance of red fox in the North Bay.
    B. Estimate basic demographic parameters (reproduction, survival, and potential immigration and emigration).
    C. Document daily and seasonal movements and habitat use.
    D. Determine the diet of the red fox in the North Bay.

2. Develop a control strategy to minimize the impacts of the red fox on native biota.
    A. Quantify the impact on each target species from red fox predation.
    B. Determine the timing, location, and level of effort required to reduce the red fox population to levels where they no longer pose a significant threat to the native biota.

It must be noted that this project is not a control program. We will need to obtain the basic information necessary to develop the most efficient control program possible. Obtaining this information will require that we capture and release individual red foxes after fitting them with radio collars. If any individual appears to be particularly adept at preying on species listed as threatened or endangered, these individuals can be removed. At the end of the investigation (three years), any remaining individuals with collars can be located and removed from the area. Using the information we obtain, we will work with the resources agencies to develop a red fox management program that maximizes the efficiency of the control methods.

Proposed Scope of Work to Meet Objectives

Field Monitoring

The primary method of completing the tasks outlined under objective 1 is by trapping individuals, fitting them with radio transmitters attached to collars, and monitoring their movements and activity over the course of time. We will also collect fox scat and remains from around dens to quantify the diets of individuals. These activities are extremely labor intensive and will require a number of people in order to obtain as much information as possible in a short period of time. The goal is to learn as much as possible about the fox and its potential risk to the native biota in as short a time as possible. The control program would then be initiated as soon as possible to insure that the fox causes the least amount of damage to the native biota.

Trapping will be conducted throughout the North Bay to capture as many red fox as possible. Box-type traps will be used. We will not use leg-hold traps in case these animals need to be removed from the area later in the study. We will use a variety of baits in an attempt to maximize our capture rates. Red fox are typically hard to capture, and respond to several types of baits depending on their diet in the area (R. Golightly, pers. comm). Any other animal captured in the traps will be noted as to species and sex and released.

At first capture, individuals will be fitted with a radio transmitter with a mortality mode, and standard demographic information recorded: sex, body mass, reproductive condition, and approximate age (from tooth patterns). At each capture, a Global Positioning System unit will be used to obtain an exact location. Habitat information will be recorded, but the primary habitat

model will be developed using a GIS analysis (see below). We have found that handling is stressful, and that lightly anesthetizing individuals is the safest for the animals. Individuals will be anesthetized using a combination of ketamine:xylazine (5:1).

1A. Estimate the abundance of red fox in the North Bay.
Abundance will be estimated using either (or both) of two methods. If we are confident that we have been able to trap and collar all fox, in the North Bay, we will estimate fox population numbers simply by actual count. If we are able to capture animals only over a portion of the North Bay, we will estimate population abundance by extrapolating the densities found in the core sample area to the amount of available habitat.

1B. Estimate basic demographic parameters (reproduction, survival, and potential immigration and emigration).
The goal of this task is to be able to parameterize a Lefkovich matrix model to make the projections of population size. The primary parameters are survival from one stage to another, and fecundity (defined as the number of females weaned per adult female per year). Survival will be estimated by analyzing the mortality data from radiotrack records. If mortality can be detected within a short period after death, we will extract a canine to determine age and then be able to determine age-specific survival. Alternatively, we can use the periodic radio-monitoring data to determine survival using a survival estimator such as the software program SURGE. We have the software and have used it to estimate survival for rodents. Reproduction will be estimated from monitoring individual females during the reproductive season. We will locate dens by following transmitter signals, and also by searching likely denning sites in the region. Once located, we will determine the number of offspring emerging from the den, the number weaned, and the number raised to independence. Immigration into the study area is possible from several areas including the Napa and Sonoma valleys, down the Petaluma River corridor, and from the east side of the Marin coast. S. Riley is currently finishing a study of carnivores on the west side of Marin, and has not found any red fox in the area. However, red fox are quite adept at surviving in urban and suburban settings and may exist in the hills just west of the North Bay. We will concentrate trapping efforts in these areas to determine if animals are moving through and taking up residence in the North Bay. The alternative to monitoring movement is to perform a genetic analysis to identify specific (rare) markers from potential source populations, and determine the number of individuals carrying those markers in the North Bay. Such an analysis is an entire project by itself. We assume that emigration out of the North Bay is minimal, however, there may be movement of yearlings among locations within the North Bay. We will attempt to capture and radio collar yearlings prior to dispersal. We anticipate that males will disperse farther than females, as is the pattern typical of mammals (Johnson and Gaines 1990).

1C. Document daily and seasonal movements and habitat use.
After animals are fitted with radio collars, they will be monitored in two different ways; periodic scans to determine location within the area, and intensive monitoring to understand daily movements. All animals will be located at least twice per week, but may be located more often depending on the number of animals collared. Locations will be determined by standard triangulation techniques. We have considerable experience with radio-tracking animals (size range of rodents to mid-sized carnivores) and are familiar with the methods for tracking and

analyses. Collars will produce a mortality signal when the animal dies. Because animals are scavenged very quickly, it is necessary to find the animals as quickly as possible after death, and so we will need to monitor them as often as possible.

The second type of tracking activity will be intensive monitoring over 24 hours. The purpose of this activity is to determine where the animal moves each day so that we can understand the animal's habitat use and the amount of time that the foxes are in proximity to the species of concern in the area. Animals will be monitored each hour for 24 hours. Unless the number of collared animals becomes very large, this intensive sampling will be performed on each animal three times per season. Another aspect that intensive monitoring will allow us to do is locate den sites. Once located, we will be able to monitor reproduction, and characterize the den sites in the North Bay. The specifics of the control strategy will depend on whether the population in the North Bay is being recruited from outside the area, from within the area, or both.

All locations will be placed into a GIS and mapped on the coverages available for the North Bay through UC Davis. We are currently conducting a large EPA funded study of the Sacramento River/Delta system and are using GIS in that analysis. We will be able to use the coverages developed through that project to support our analyses. At the least, we will be able to use topography and topographic features, and basic vegetation type. We will calculate home ranges using any of several home range techniques (e.g., minimum convex polygon, 95% kernel), the exact method used will depend on the sample sizes. All home ranges will be analyzed by season and year.

1D. Determine the diet of the red fox in the North Bay.
Diet analysis will be based on analyses of scat and any remains of prey items collected at the den sites. Standard techniques for processing and analyzing scats will be used (S. Riley, unpub ms). The postdoctoral research associate for this project, S. Riley is currently completing a diet analysis of gray fox, bobcat, and coyote in the Marin headlands area as part of his doctoral dissertation. Consequently, we are intimately familiar with scat analysis. Items in scat and remains of prey will be identified to the lowest taxonomic level possible using reference material available through the UC Davis Museum and various taxonomic keys. Scat from coyotes and gray fox (if present) could be confused with red fox scat. Species identification will be made by examining hair present in the scat resulting from autogrooming. Any scat not capable of being identified will be excluded from the analyses.

2A. Quantify the impact on each target species from red fox predation.
We will develop an impact index for each species of biota in the North Bay that is of concern. We will discuss the individual species with the resources agencies, but we anticipate at the least, developing an index for California clapper rails, salt marsh harvest mice, California black rails, San Pablo song sparrows, and the San Pablo vole (*Microtus californicus sanpabloensis*). The impact assessment includes an analysis of the exposure of the target species to the stressor and the effects of the stressor on the target population. From habitat use and activity data, we will determine the amount of spatial overlap between the fox and the target population. Given that overlap exists, scat analysis will be used to determine if fox do consume individuals from the target population, and in what amount. Finally, we will make an estimate of the potential effect the predation could

have on the target population. We will characterize the impacts by developing GIS coverages of potential population reductions of the target populations.

2B. Determine the timing, location, and level of effort required to reduce the red fox population to levels where they no longer pose a significant threat to the native biota.
The primary method of control is trapping and removal of red fox, and we anticipate that this will remain a primary method. We will work with the resource agencies and Animal Damage Control to develop recommendations that will improve the efficiency of the control program. We will use the demographic information collected by trapping and monitoring red fox to develop a projection model that will provide the necessary information to allow us to target specific age/stage classes for removal. We will make recommendations about the location, timing, and effort to expend to maximize the reduction in the red fox population. Also, after the project is complete, we will provide the resources agencies with the projection model which can be used to determine the projected reduction in red fox numbers as a result of the removal program.

While removal may be the primary method of control, other recommendations will be made to reduce the number of red fox. For example, if during monitoring, it is determined that specific areas within the North Bay are preferred denning habitat, those areas can be targeted for habitat modification to reduce the attractiveness. Also, one of our goals is to determine if there are corridors for immigration of red fox from adjoining areas which can then be modified to reduce the effectiveness of the corridor.

Monitoring and Data Evaluation
All data and results will be made available to CALFED agencies. Results will be published in peer reviewed journals. During the course of the project, we will work closely with the U.S. Fish and Wildlife Service, California Department of Fish and Game, the U.S. Geological Survey Biological Resources Unit, and Animal Damage Control to develop the most efficient management strategy possible.

Implementability
There are no problems to implementing this project. Trapping and handling red fox requires appropriate state and federal collecting permits and for the participants to be certified by the California Department of Fish and Game to handle and anethesize animals. S. Riley, the postdoctoral research associate holds all necessary permits as part of his current research on the interactions of foxes and bobcats in the Marin headlands and the northern part of Marin county. Graduate students working on the project will be permitted before beginning work. In any project that involves live animals, we are required to file an Animal Handling Protocol with the UC Davis Animal Care Unit. We will file the protocol prior to beginning the project.

Literature Cited

Garcia, E. J. 1995. Conservation of the California Clapper Rail: An analysis of survey methods and habitat use in Marin County, California. MS Thesis, University of California, Davis.

Golightly, R. T. Jr., M. R. Faulhaber, K. L. Sallee, and J. C. Lewis. 1994. Food habits and management of introduced red fox in Southern California. Pp 15-20 *In*, W. S. Halverson and A. C. Crabb, Eds. Proc. 16th Vertebr. Pest Conf., University of California, Davis.

Harvey, T. E., K. J. Miller, R. L. Hothem, M. J. Rauzon, G. W. Page, and R. A. Keck. 1992. Status and trends report on wildlife of the San Francisco Estuary. San Francisco Estuary Project. Oakland, CA.

Johnson, M. L. and M. S. Gaines. 1990. Evolution of dispersal: theoretical models and empirical tests using birds and mammals. Annu.Rev. Ecol. Syst. 21:449-480.

Monroe, M. W. and J. Kelly. 1992. State
the San Francisco Bay/Sacramento-San Joaquin Delta estuary. San Francisco Estuary Project. Oakland, CA.

Cost and Schedule to Implement Proposed Project
Budget 10/01/97 - 09/30/00

	Year One	Year Two	Year Three	Total
PERSONNEL				
M. Johnson 6 mo. @ 100% @ $6350/mo	$39,053.*	$41,005.**	$43,055.***	$123,113.
Graduate Research Assistant 9 mo academic @ 50% 3 mo summer @ 100%	16,899.+	17,744.+	18,631.+	53,274.
PGRE, Step 5 12 mo @ 100%	33,692.^	35,377.^^	37,145.^^^	106,214.
PGRE, Step 1 6 mo @ 100%	14,336.+	15,052.+	15,805.+	45,193.
Technical Support 4 mo. @ 100%	8,099.+*	8,504.^+	8,930.^*	25,533.
TOTAL SALARIES	**$112,079.**	**$117,682.**	**$123,566.**	**$353,327.**
Fringe Benefits *23.76%, **24.26%, ***24.76%, +3.8%, ^17.63%, ^^18.13%, ^^^18.63%, +*23.88%,^+24.38% ^*24.88%	18,338.	19,679.	21,109.	59,126.
TOTAL PERSONNEL	**$130,417.**	**$137,361.**	**$144,675.**	**$412,453.**
Student Fees $1,495. per qtr. 1st year $1,569. per qtr. 2nd year $1,648. per qtr. 3rd year	4,485.	4,709.	4,944.	14,138.
Equipment 3 receivers, Telonics TR-2, 30 Transmitters with collars & mortality signals, scanner programer	23,014.	14,550.	0.	37,564.
Supplies 20 traps, 1RA-5K, 3RA-14K, 3 Antennas	4,000.	4,000.	4,000.	12,000.
Travel	8,000.	8,000.	8,000.	24,000.
TOTAL DIRECT COST	**$169,916.**	**$168,620.**	**$161,619.**	**$500,155.**
INDIRECT COSTS @ 44.5% Year 1 and 46% Years 2 & 3 (Total Direct Costs less Student Fees & Equipment)	63,376.	68,706.	72,071.	204,153.
TOTAL COSTS	**$233,292.**	**$237,326.**	**$233,690.**	**$704,308.**

NOTE: Personnel and fees increased by 5% in the second and third years.

I-000919

Scheduled Milestones

Year 1.
1. Initiate trapping and radio tracking of individual foxes within the North Bay.
2. Begin trapping fox along potential immigration corridors.
3. Obtain GIS coverages for North Bay and begin mapping fox movement.
4. Begin scat analysis.

Year 2.
1. Continue trapping and radio tracking of individual foxes within the North Bay.
2. Investigate patterns of dispersal in the North Bay.
3. Continue mapping fox activity in GIS.
4. Continue scat analysis.
5. Initiate development of impact analysis.

Year 3.
1. Finish radio tracking of individuals.
2. Complete diet analysis.
3. Develop demographic projection models for red fox in the North Bay.
4. Complete impact analysis.
5. Develop recommendations for control strategy.

Third Party Impacts
There will be no third party impacts as a result of this project.

Applicant Qualifications
Dr. Michael Johnson is the principal investigator and will be responsible for the completion of the project. He is an Associate Research Engineer in the Department of Civil and Environmental Engineering at the University of California Davis, and is a Graduate Advisor for the Conservation Biology Area of Emphasis in the Graduate Group in Ecology. Trained as a mammalian population biologist, he has been conducting mark-recapture studies on mammals for over 20 years and has numerous publications on the demography and dispersal. Dr. Johnson is also an expert in risk analysis, and teaches ecological risk assessment. He has developed computer models to evaluate the effects of management options on species' demographic performance. He holds all appropriate federal and state permits to conduct the research.

Seth Riley will be the postdoctoral research associate on this project. He is completing his PhD at the University of California, Davis in the Graduate Group in Ecology (October 1997). His dissertation research is on the ecology of bobcat and gray fox in the Marin headlands and the west shore of Marin county. He has considerable experience trapping, handling, anesthesizing, collaring, and radio tracking fox (and other mid-sized carnivores that we might encounter). He holds all necessary permits to conduct this project.

Compliance with Standard Terms and Conditions

Standard terms and conditions of this contract are those that apply to state agencies as shown in Table D-1 of the RFP. These do not require any paperwork until the final contract is in place. The standard University of California Office of Research Data Sheet has been completed and includes approval for submittal of this proposal by the Dean of the College of Engineering, and the UC Davis Office of Research. This approval includes agreement by Dr. Michael Johnson to the standard terms and conditions of the UC Davis OR data sheet. These forms are attached.

Item 8

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California

OFFICIAL'S NAME: Sandra M. Dowdy
Contracts and Grants Analyst

DATE EXECUTED: JUL 25 1997

EXECUTED IN THE COUNTY OF: YOLO

PROSPECTIVE CONTRACTOR'S SIGNATURE: Sandra M. Dowdy

PROSPECTIVE CONTRACTOR'S TITLE:

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

I-000922